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THE SMALL SPECIES OF *EUCHONE* MALMGREN (SABELLIDAE, POLYCHAETA)[1]

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This paper reviews all of the previously known members of *Euchone* Malmgren with 12 or fewer abdominal segments preceding the anal depression and describes *Euchone hancocki* and *E. southerni*, with a subspecies *E. southerni incisa*. Following the special part, a key for the treated species is given, and a direction for further work on the origin of Sabellidae is suggested.

The starting point for the reconsideration of the small species of *Euchone* is the observation that in two species represented by many specimens, *E. incolor* Hartman and *E. hancocki* new species, the number of abdominal setigers before the beginning of the anal depression is constant. These species are each uniquely characterized by their glandular girdles on abdominal segments and can be identified without considering the characters used previously for identification. Therefore, more emphasis is given here to the number of anterior abdominal setigers for distinguishing the small species of the genus than

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SEP 25 1970

has been given by earlier authors.[2] However, the feature does not seem to be useful for the species with more than about 20 abdominal segments, and apparently varies in the small *E. arenae* Hartman, discussed below.

Whereas previous authors stressed the number of segments forming the anal depression (or funnel) as a diagnostic character, it is recognized here that the full complement of segments is not present in juveniles. Therefore, this character cannot be relied upon unless mature animals are studied, whereas all anterior abdominal setigers are present when the first depression segment is formed.

Some authors have already drawn attention to the fact that the uncini of the depression segments may differ markedly from those of the anterior abdominal setigers by having relatively higher crowns of teeth above the rostra (cf. Fig. 1e); the present study shows that this condition is common. It is thus necessary to state from which region uncini are described. Not only are the relative proportions of the uncini changed, but the teeth above the rostra are considerably more numerous than those of the "typical" anterior hooks. However, *small* differences in the number of teeth seen in the side view of thoracic or abdominal hooks are not considered of diagnostic value. Slight variations in numbers of teeth have been found by different authors working on the same sample or even the same specimen, presumably because of slightly varying orientation of the setae or varying resolution of the microscopes (even the general outline of thoracic limbate setae or abdominal uncini has not been described correctly in many cases).

Throughout this work, staining of epidermal mucus cells, following the suggestion by Hofsommer (1913), has been employed. Specimens are left for a few minutes in a very dark solution of methyl green in ethyl alcohol and are then differentiated for a few minutes. The remaining dye is removed by alcohol in a few hours or days, depending on the

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[2] In the text as well as in the key, the term "anterior abdominal setigers" refers to the segments preceding the anal depression. In many species the segment immediately before the first depression segment is modified such that the ventral shield is deformed or that the intra- and posterior intersegmental furrows do not reach the fecal groove (see the eighth abdominal setiger of *E. southerni incisa*, Fig. 5a). Such segments are called here "transition segments."

dye concentration and the size of the specimen. The distribution of stain-accepting cells not only facilitates counting of segments but yields additional characters for identification. Because the degree of variability has been studied only in *E. incolor*, the diagnoses given below are still based on conventional characters, but the distribution of stain-accepting cells has been included in the descriptions. Unlike the other figures, the figures of the staining patterns present body outlines and setae schematically.

All species studied so far, including larger ones to be treated elsewhere, have a postsetal girdle of glands in the second thoracic setiger (cf. Fig. 1a). It had been previously reported for some species only.

In view of the new observations, the genus *Euchone* can still be considered as very homogeneous, although some species emerge as being more primitive than others. The following characters should be added to the generic diagnoses as given by Fauvel (1927), Ushakov (1955) and Day (1967).

> A postsetal girdle of glands on the second thoracic setiger. Three kinds of notosetae, 1) upper ordinary limbate, 2) median spatulate or subspatulate, and 3) lower short limbate setae with very thin wings.[3] Ventral shields sometimes present.

Euchone rosea Langerhans

Fig. 1

Euchone rosea Langerhans, 1884, p. 271.

E. rosea.—McIntosh, 1923, p. 286 *partim* (see also *E. southerni southerni*).

E. rosea.—Kirkegaard, 1959, p. 101 *partim* (see also *E. southerni incisa*).

not *E. rosea.*—Southern, 1914, p. 144 (see *E. southerni southerni*).

not (?) *E. rosea.*—Berkeley and Berkeley, 1954, p. 468 (see *E. incolor*).

not *E. rosea.*—Berkeley, 1968, p. 556 (same record as Berkeley and Berkeley, 1954).

not *E. rosea.*—Day, 1967, p. 774 (see *E. southerni incisa*).

Types: The type material collected in Madeira is apparently lost: The Museum at the Zoological Institute of the University of Freiburg, Germany where Langerhans worked has been destroyed (Prof. K. Sanders,

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[3] Variously called by earlier authors basal, bayonet, or geniculate setae. In large species they insert anterior to the spatulate setae as also in *Chone*.

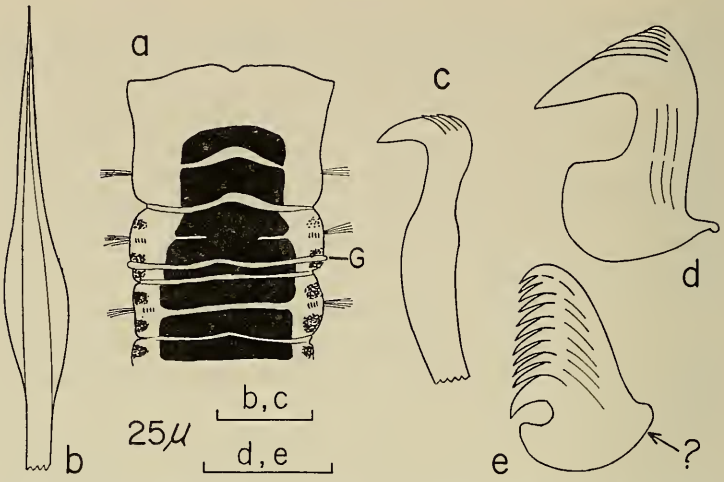

FIG. 1. *E. rosea*, from Ivory Coast: a, staining pattern of anterior end in ventral view (G: glandular girdle); b, median seta from thoracic (7th) notopodium; c, thoracic hook; d, uncinus from anterior (2nd) abdominal segment; e, uncinus from depression (13th) segment (question mark indicates my uncertainty about the exact outline).

26 Jan. 1968). Furthermore, none of the material is at the Zoological Museum of the Humboldt University at Berlin (Dr. G. Hartwich, 24 February 1969), where the collections of the Academy of Sciences, Berlin, which supported Langerhans' travel, are deposited.

Diagnosis: A *Euchone* species with 10–12 anterior abdominal setigers and six to seven depression setigers. Palmate membrane uniting the radioles for at least half their length. Distinct ventral shields. Spatulate setae in thoracic notopodia. Abdominal uncini markedly different between anterior and posterior setigers.

The diagnosis is based on the description by Langerhans (1884), except with regard to the numbers of anterior and depression setigers. The total number of abdominal setigers is 18.

Material studied: Atlantide station 65, 11 January 1946, Ivory Coast, 4°24′ N, 7°05′ W, 78 m (collected and identified as *E. rosea* by J. B. Kirkegaard). ZMC, journal entry of 1 December 1946. (One specimen.)

Description: The animal from the Ivory Coast is described here in some detail because it comes closest to the original description of the species, which otherwise is not adequately known. The specimen is complete. Its length is about 12 mm, of which the branchial crown contributes about 5.5 mm; its width is 0.8 mm. It has eight thoracic and 18 abdominal setigers. Ten of the latter are anterior, and the 11th is transitional; the anterior border of the anal depression is situated in the 12th abdominal setiger.

The branchial crown consists of eight pairs of radioles with pinnules, united about two-thirds of their length by a palmate membrane, and three or four pairs of short naked filaments. Each radiole carries three to four dozen pairs of pinnules of about equal length. Beyond the palmate membrane, a flange borders the radioles and reaches to the ends of the terminal pinnules. The filiform tips of the radioles are about one-tenth of the total radiole length.

The high collar protrudes slightly foward on the ventral side where a small notch is found (Fig. 1a); in addition there is the usual dorsal incision. A postsetal girdle of glands encircles the second thoracic setiger. Conspicuous ventral shields cover the underside of the thoracic and abdominal setigers. The shields are very obviously divided into presetal and postsetal pairs in the abdomen.

Thoracic notopodia (after the first one) contain a few geniculate setae with narrow wings besides the upper, long limbate and the median, subspatulate (Fig. 1b) setae. Neuropodia have about a dozen hooks with slender beaks (Fig. 1c). The abdominal uncini differ markedly between the anterior and posterior tori (Fig. 1d, e).

After treatment with methyl green, the ventral pattern in the thorax delineates the shields (Fig. 1a) and shows that most are divided also in the thorax. A division of the shield on the second setiger into a presetal and a postsetal ring is rudimentary and can barely be discerned. An outstanding feature of the specimen is the clear separation of the lateral staining areas from the ventral shields through the fourth setiger. In the entire thorax the lateral fields do not continue onto the dorsal side. Dense rings of staining cells encircle the whole abdomen (except the fecal groove) separated by broad rings at the segmental borders and more narrow ones in the plane of the parapodia. The latter rings are absent on the segments contributing to the anal depression. The stained areas continue onto the wings of the depression. Also the pygidium accepts the dye.

Discussion: The material from the Ivory Coast agrees with that from Madeira (type locality) in the number of abdominal segments and possibly also in the number of setigers of the depression. Further, there is the marked divergence of the anterior and posterior abdominal hooks (present also in other species, however). It may be pointed out that Langerhans did not note a posterior extension (Fig. 1d) of the anterior hooks. The Ivory Coast form is more than twice as long as the type material, although the latter contained mature females. Possibly, total length and number of radioles are correlated within species so that the difference in length may explain the differences in the number of radioles between the type material (five pairs with pinnules) and the present specimen. Another feature in which the form from the Ivory Coast disagrees with that from the type locality is the palmate membrane, which in Langerhans' material extended only to one-half the length of the radioles. More important is that Langerhans depicted a spatulate thoracic notoseta with a short tip which I believe is clearly different from that shown in Fig. 1b. New material from the type locality may show whether these differences are significant.

Euchone olegi Zachs from the Sea of Japan (for additional description, see Buzhinskaja, 1967) is not yet clearly distinguishable from *E. rosea*, as defined here.

Euchone trilobata (Banse) new combination

Desdemona trilobata Banse, 1957, p. 92.

Type: Holotype, from the Falkland Islands, SMNH, type collection no. 1900.

Diagnosis: A *Euchone* species with two anterior abdominal setigers and four depression setigers. Radioles without flange or palmate membrane. Ventral shields absent. Middle series of thoracic notosetae with narrow wings. Abdominal uncini without rostra (pectinate).

Material studied: Holotype.

Additions to the Description: The second thoracic setiger has an indistinct postsetal girdle of glands. The thoracic notopodia have long limbate setae, shorter limbate ones in place of the usual spatulate setae, and a series of short fine limbate setae. The wings of the middle series seem to be hardly broader than those of the large limbate bristles; without dissection, the short setae cannot be described properly. Ellipsoidal eggs have a longest diameter of about 100 μ.

In the original description, (Banse, 1957) fig. 8b was incorrectely drawn: the wings of the anal depression terminate in the third abdominal setiger (cf. Banse, 1957, fig. 8c).

After treatment with methyl green, a small ventral area on either side of the border between the first segment and the first setiger stains fairly strongly and uniformly. Pairs of bands of scattered stained cells, interrupted by the fecal groove in the abdomen, are present ventrally in the last two or three thoracic and first two abdominal setigers in place of the ventral shields found in other species. Also the pygidium accepts the dye.

Discussion: The species had been assigned in 1957 to *Desdemona* Banse because of the form of the abdominal uncini lacking rostra. However, in view of the pectinate uncini of *E. arenae* and *E. hancocki*, which occur together with the "typical" uncini of *Euchone*, the combination with *Desdemona* must be considered as erroneous.

Euchone limnicola Reish

Euchone limnicola Reish, 1960, p. 717.
Euchone limicola.—Hartman, 1966, p. 203.

Types: Holotypes: AHF. Paratypes, AHF, USNM and British Museum (Natural History), London.

Diagnosis: A *Euchone* species with eight anterior abdominal setigers and ten depression setigers. Palmate membrane uniting the radioles for two-thirds of their length. Ventral shields present in thorax. Subspatulate setae in thoracic notopodia.

The diagnosis follows the description by Reish (1960).

Material studied: None.

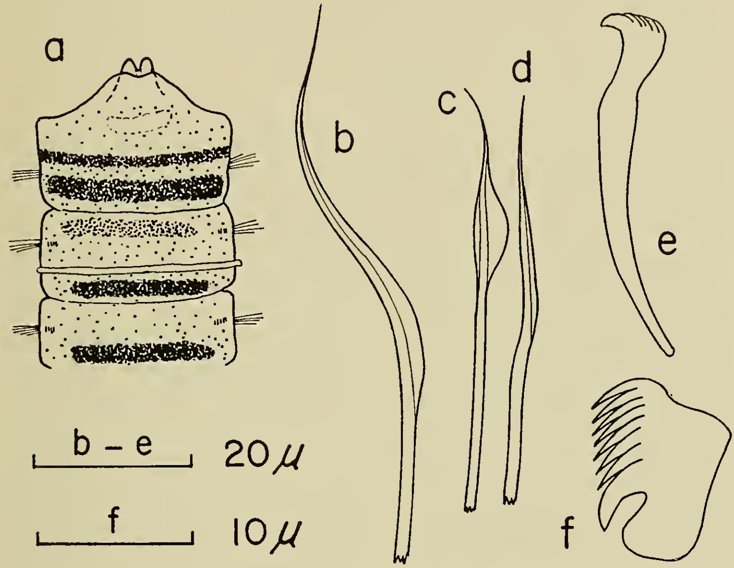

FIG. 2. *E. incolor*; a from type sample, the others from Puget Sound: a, staining pattern of anterior end in ventral view; b-d, upper, median, and lower setae from thoracic notopodia; e, thoracic hook; f, uncinus from anterior abdominal segment.

Euchone incolor Hartman

Fig. 2

Euchone incolor Hartman, 1965, p. 231 *partim*.—1966, p. 203 *partim* (see *E. hancocki*).

(?) *Euchone rosea*.—Berkeley and Berkeley, 1954, p. 468.

Euchone rosea.—Berkeley, 1968, p. 556 (same record as Berkeley and Berkeley, 1954).

Euchone trisegmentata Reish, 1965, p. 150.—Nichols, 1968, p. 16, 61.

Euchone barnardi Reish, 1968, p. 93.

Types: AHF.

Diagnosis: A *Euchone* species with six anterior abdominal setigers and three depression setigers. A presetal girdle of glands on third abdominal setiger. Palmate membrane reaching one-quarter to one-half of the length of radioles. Ventral shields absent. Subspatulate setae in thoracic notopodia.

Material studied: Three specimens from the sample from which the holotype was taken. Continental shelf off New England (station C 1, Hartman, 1965). AHF.

Three specimens from *Velero IV* station 3585 (see Hartman, 1966). AHF.

The four specimens of Berkeley and Berkeley (1954), from Hecate Strait, British Columbia. USNM 38984.

Holotype of *E. trisegmentata*, southeastern Bering Sea. USNM 30456.

Many specimens from stations, B, C, F, J, and K of Nichols (1968), Puget Sound, Washington (identified as *E. trisegmentata* by K. Banse). Some in USNM, No. 39812.

The three paratypes of *E. barnardi*, Gulf of California. USNM 38403.

New records: Many specimens from *Velero IV* station 2152, 27 Sept. 1952, near Santa Catalina Island, California, 33°23′33″ N, 118°21′47″ W, 25 m, sandy mud (identified as *E. incolor* by O. Hartman); AHF. One specimen from *Velero IV* station 2153, 27 Sept. 1952, near Santa Catalina Island, California, 33°24′28″ N, 118°21′36″ W, 81 m, broken shells and mud (identified as *E. incolor* by O. Hartman); AHF. Many specimens from station 1514 E5 of SEP, in Cape Cod Bay, 41°54′ N, 70°11′ W, 19 January 1967, 17.5 m, muddy sand (sample total, 47 specimens). Many specimens from station 1624 Ep of SEP, in Cape Cod Bay, 41°52′ N, 70°44′W, 13 May 1968, 31–32 m, sandy mud (sample total, 110 egg-bearing as well as juvenile animals). Three dredge stations near Orcas Island, Washington (48°38′ N, 122° 59′ W, 15 m, mud, 6 specimens; 48°35.5′ N, 122°55′ W, 27 m, mud, 13 specimens; 48°36′ N, 122° 47′ W, 40 m, mud, 64 specimens); all in July 1967; H. L. Sanders coll.—Some animals from the last three stations deposited in USNM (No. 40717), some in Friday Harbor Laboratories, University of Washington.

Additions to the Description: Specimens from the type locality, the Bering Sea, Hecate Strait, and Puget Sound (material of Nichols, 1968) provided the basis for the following observations.

The branchial crown makes up about one-third of the total length of the animals from the type locality, as is the case also for the material from the Pacific Ocean. In the longest animals from Woods Hole (7 to 8 mm) the contribution by the crown to the total length is one-fifth to one-fourth. Three pairs of radioles with pinnules are present in animals from all sites, each pair with a conspicuous axis consisting of a double row of cartilaginous cells, and two to four ventral pairs of single filaments almost half as long as the radioles with pinnules, likewise with conspicuous cellular axes. In the well-preserved material from the type locality, two pairs of large lips at the sides of the mouth opening are distinct; in a few animals, a thin palmate membrane, approximately one-quarter of the length of the radioles, could be made out. The pinnules arising in the mid-section of the radioles are longer than the distal ones so that many pinnules end at about the same level (but below the tips of the radioles). This gives the species an appearance superficially similar to species of *Fabricia* Blainville or *Oriopsis* Caullery and Mesnil. The free ends of the radioles extend about one-fourth to one-third of the length of the branchial crown beyond the most distal pinnules. The collar, as observed in animals from Puget Sound, is higher ventrally than laterally, with a slight ventral notch in the median line (Fig. 2a), plus a slight notch on each side, and the usual deep dorsal incision. Otocysts are present on the first segment.

The species has a postsetal girdle of glands on the second thoracic setiger, and a similar but less conspicuous presetal girdle on the third abdominal setiger. Ventral shields are absent. Forty-seven specimens from the sites mentioned, ranging from 2.5 to 8.5 mm in length (mostly above 4 mm), had nine abdominal setigers. The anal depression, which was observed in 25 to 30 specimens extended through three setigers in all except four, where the anterior ending reached the middle of the fourth to last setiger. The two smallest specimens in sample SEP 1624, about 1.4 and 1.8 mm long, had only six and seven abdominal setigers; the anal depression was not yet visible in either. In grown animals, the anal depression can have narrow wings as in fig. 3a of Reish (1965); when the wings are expanded a slight notch separates them at the anterior end of the depression.

In all animals studied, the thoracic notopodia, excepting those on the first setiger, contain three kinds of setae (Fig. 2b, c, d). A capillary seta with narrow wings accompanies each of the approximately three subspatulate notosetae. The approximately half a dozen abdominal neurosetae have slightly wider wings than do the lower thoracic notosetae. A thoracic hook is shown in Fig. 2e (from Puget Sound). Also in specimens from the type locality, the number of teeth of the thoracic uncini when viewed from the side is greater than three to four as stated in the original description. The shapes of the abdominal uncini (Fig. 2f) do not vary between the anterior and depression segments.

In two animals of 8.3 and 8.5 mm length from Woods Hole, the setigers from the third thoracic through the sixth abdominal contained eggs of almost cubic shape (80 μ–100 μ side length). The total egg number was 300 to 350.

In all specimens treated with methyl green, a small area ventrally behind the collar remained unstained (Fig. 1a), as did the branchial crown. Most of the body took on a greenish hue. Against this background, the first setiger of the specimen from the type locality stained strongly ventrally and laterally, the region of the parapodia remaining pale. The anterior ring of pigment indicated on the first setiger extended dorsally to the fecal groove, which again remained pale. Other features are shown in Fig. 1a. In specimens from Bristol Bay as well as from Puget Sound,

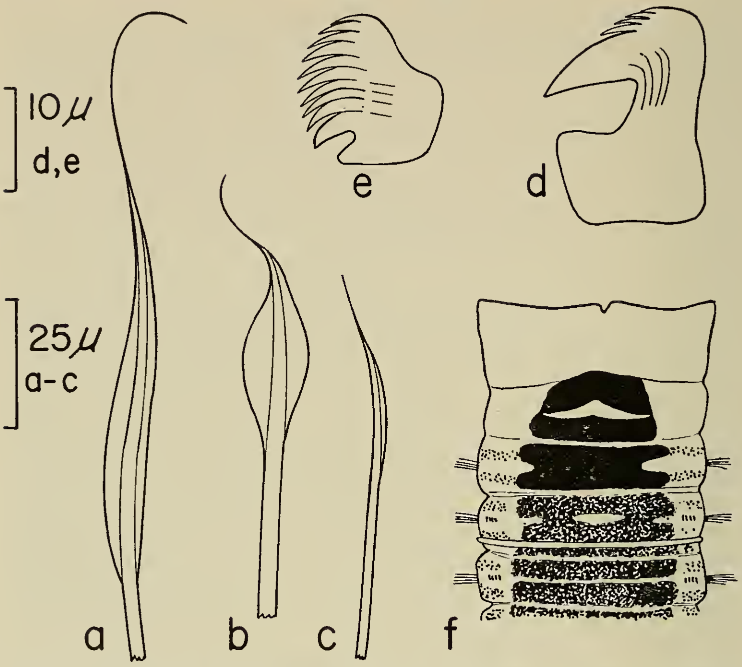

FIG. 3. *E. arenae*, from type locality: a-c, upper, median, and lower setae from thoracic notopodium; d, e, median and dorsalmost uncini from anterior abdominal (4th) notopodium; f, staining pattern of anterior end in ventral view.

almost no stained cells occurred in the first setiger. However, these animals exhibited a moderately strongly stained area ventrally on the second setiger anterior to the plane of the parapodia and a strongly stained area behind the girdle of glands on this setiger. Another strongly stained area occurred ventrally in the rear portion of the third setiger. The fourth thoracic setiger was strongly stained in the corresponding area in the material from the type locality and weakly so in that from the cool-temperate Pacific Ocean.

The animals from Woods Hole (including the very small ones), as well as those from the Gulf of California, stained rather uniformly ventrally on the first four thoracic setigers, excepting dye-free rings in the planes of the setae. Usually, presetal bands of pigment dorsally reached the fecal groove in these setigers in the animals from Woods Hole, whereas in those from the Gulf of California the postsetal bands were more pronounced.

A ring along the abdominal girdle of glands and the corresponding area of the fourth abdominal setiger stained in all animals from all sites; both pigment rings were interrupted by the fecal groove. Noticeably in material from the Atlantic and the Gulf of California, single scattered stained cells occurred ventrally in all thoracic and first abdominal setigers. Also, concentrations of these cells were observed in some specimens ventrally near the posterior borders of the first and second abdominal segments.

Discussion: The list of synonyms is based on the presence of the presetal girdle of glands on the third abdominal setiger as the principal distinguishing character of the species. No attention has been paid to the details of the outlines or shapes of setae reported by the various authors. Particularly the study of the original material of this species led to the statements made on p. 388. *Euchone incolor*, published on 5 April 1965 has priority over *E. trisegmentata* published on 25 August 1965.

It remains to be seen how widely the species is distributed in the Atlantic Ocean. It was not present on the two stations checked by me (G 1 and Ch 35 Dr 12, besides the type locality), among the stations listed by Hartman (1965) for *E. incolor*: The sample from station G 1 at about 2000 m depth off New England contains a *Euchone* sp. with apparently 12 abdominal setigers (four or five in the depression) and without the abdominal glandular girdle of *E. incolor*. The species found on station Ch 35 Dr 12, on the continental slope off Brazil, likewise is without this girdle and is probably different from the species found on station G 1. One previous record of the species off southern California is considered to be that of a new species, *E. hancocki*.

Euchone arenae Hartman

Fig. 3

Euchone arenae Hartman, 1966, p. 202.
Euchone cortezi Reish, 1968, p. 94.

Types: AHF.

Diagnosis: A *Euchone* species with six to nine anterior abdominal setigers and six depression setigers. Palmate membrane extending to less than one-fourth of the length of radioles. Ventral shields present. Subspatulate setae in thoracic notopodia. Marked divergence of shape among abdominal uncini within tori.

Material studied: Two specimens from the sample from which the holotype was taken. Near Santa Catalina Island, California (*Velero IV* station 2788, cf. Hartman, 1955). AHF.

Paratypes of *E. cortezi* from the Gulf of California. USNM 38405.

Additions to the Description: The two specimens from the type locality have 13 and 14 abdominal setigers, respectively, but Hartman (1966) has found animals with 15 setigers. In one of the present specimens, it could be seen that the radioles bearing pinnules each have a narrow flange for about two-thirds of their length. This is well beyond the palmate membrane that was observed by Hartman (1966) to unite less than one-fourth of the length of the radioles. The free ends of the radioles beyond the origin of the most distal pinnules comprise about one-sixth of the length of the radioles and extend beyond the ends of the pinnules. Pinnules arising in the middle of the radioles are almost half as long as the radioles and reach about as far as the distal pinnules. Ventral shields are present in the thorax and the abdomen.

Thoracic notosetae are of three kinds (Fig. 3a, b, c) except on the first setiger. Most abdominal uncini (checked on the first and the fourth setiger) have broad bases and large rostra surmounted by about four rows of short teeth (Fig. 3d). The two dorsalmost uncini in both tori, however, lack these broad bases, the rostra are small, and the surmounting teeth (almost ten rows of many teeth) are about as long as the rostra (Fig. 3e), *i.e.*, they can be called pectinate. The uncini of the depression segments are as in the later figure, with about ten teeth per horizontal row.

About five polygonal and ellipsoidal eggs per segment, up to about $100\,\mu \times 100\,\mu \times 70\,\mu$, were found from the fifth thoracic to the fourth abdominal setigers. They possibly occur farther forward and rearward as well.

In specimens treated with methyl green, only the anterior part of the collar, a transverse line at the origin of the collar on the ventral side, and the postsetal girdle of glands on the second thoracic setiger are essentially unstained (Fig. 3f). Otherwise the entire epidermis accepts the dye readily, but most of the collar and the entire fecal groove remain relatively pale. Ventrally, the most intensively stained area is immediately behind the mentioned transverse line on the collar. The staining extends to the posterior border of the first setiger. Patterns on the following three, ventrally strongly stained setigers, were difficult to work out; clearly from the third setiger a pale ring in the plane of the parapodia divides the shields. Two broad rings of staining cells per segment continue laterally and dorsally, particularly in the abdomen. In the thorax, beginning at the second setiger, the rings tend to be separated from the shields by unstained epidermis (Fig. 3f; cf. also *E. rosea*), but are rudimentary on most of the dorsal surface. The rings of stained cells (more or less fused within the segments) continue onto the wings of the anal depression. Also the pygidium is stained.

Discussion: The paratype of *E. cortezi*, a small specimen of 2 mm total length, has 11 or 12 abdominal setigers, of which six are in the anterior part of the abdomen; the seventh is transitional to the depression segments. Thoracic notopodia after the first one have three kinds of setae. As seen in the second to fourth abdominal segments, each notopod has two kinds of uncini as depicted for the type series of *E. arenae*. The staining pattern is slightly different from the material collected at the type locality: presetal and postsetal rings of staining cells encircle the body, except at the fecal groove, without being interrupted at the lateral ends of the ventral shields.

I consider *E. cortezi* to be a synonym of *E. arenae*, a species that Reish (1968) had not included in the discussion of his record. The variability in the number of abdominal segments and the disagreement on the height of the palmate membrane (Hartman, 1966; Reish, 1968) must be noted.

Euchone hancocki new species
Fig. 4

Euchone incolor.—Hartman 1966, p. 203 *partim.*

Types: Holotype from *Velero IV* station 2298, 24 April 1953, on the southwestern end of the top of Lasuen seamount, off southern California, 33°24′01″ N, 118°00′00″ W, 122 m, shelly sand and rocks. AHF.

Paratypes from the same station. AHF (12 specimens).

Diagnosis: A *Euchone* species with five anterior abdominal setigers and three depression setigers. Palmate membrane and ventral shields absent. Radioles flanged. Collar without distinct ventral incision. A postsetal girdle of glands on first abdominal setiger. Middle series of thoracic notosetae with fairly narrow wings. Abdominal uncini without distinct rostra.

The species is named in honor of the late Captain A. Hancock.

Material studied: Type series.

Description: The largest animals are almost 4 mm long (to which the branchial crowns contribute almost 1 mm) and 0.2 mm wide. The branchial crowns of several animals are regenerating; others have been lost. Apparently, there are four pairs of radioles that bear pinnules for about two-thirds of their length. Up to about this level, they are lined by a broad flange; a connecting palmate membrane could not be found. The free slender tips of the radioles reach well beyond the ends of the pinnules. At least one pair of bare radioles is found ventrally. On each side of the mouth opening is a narrow lip.

The collar (Fig. 4a) is of about equal height laterally and ventrally; a slight ventral notch is present in addition to the dorsal gap. Otocysts are visible. The second thoracic and the first abdominal setigers each bear a postsetal girdle of glands. However, the latter is visible only after staining. Three of the eight abdominal setigers are incorporated in the anal depression. Ventral shields are absent.

The first thoracic setiger carries fascicles of about four long and four short limbate setae; the remaining thoracic setigers each bear about four long limbate setae (Fig. 4b), usually three shorter setae have so narrow wings that they hardly can be called subspatulate (Fig. 4c) and three shorter (ventralmost) capillary bristles with narrow wings (Fig. 4d). About half a dozen long-handled hooks occur in each neuropodium (Fig. 4e). Abdominal notopodia each contain six to ten pectinate uncini with

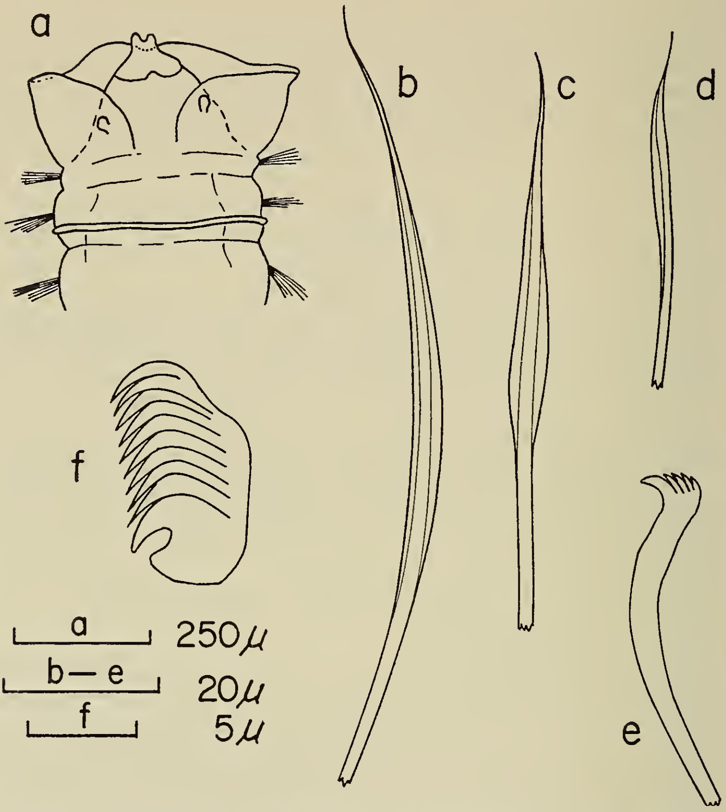

FIG. 4. *E. hancocki* new species: a, anterior end in dorsal view, with branchial crown removed; b-d, upper, median, and lower setae from thoracic notopodium; e, thoracic hook; f, uncinus from anterior abdominal segment.

notably small base plates and small rostra, above which are about nine rows of six to eight small teeth (Fig. 4f). The backs of the hooks are in side view strongly striated. The form of the hooks is uniform in the entire abdomen. The three to four abdominal neurosetae are limbate.

Two specimens appeared to have one or two eggs each in the sixth and seventh thoracic setigers. Eye spots could not be seen.

After treatment with methyl green, the branchial crown and the collar become only pale green. Otherwise, most of the body is fairly densely covered with stained cells except the girdles of glands, the segmental borders, rings in the plane of the parapodia (which appear to make the setigers biannulate), and the fecal groove. This pattern is most regular in the abdomen. In the thorax, the entire presetal area on the first setiger stains particularly strongly, as do the second and third setigers ventrally. The dorsal surface of the thorax has the fewest staining cells of the body.

Euchone southerni new species

Euchone rosea.—Southern, 1914, p. 144.
E. rosea.—McIntosh, 1923, p. 286 *partim.*

Types: Holotype from station L. 245 of a survey by the Irish Fisheries Branch, 3 September 1903, Ballynakill Harbor, NW Ireland (see Southern, 1915), 2–5 m (1–3 fathoms). NMI, No. 77.1908.

Paratype from the same sample. NMI, No. 77.1908. One specimen.

Diagnosis: A *Euchone* species with eight anterior abdominal setigers and four depression setigers. Palmate membrane to half the length of the radioles. Collar with very small ventral incision. Distinct ventral shields. Subspatulate thoracic notosetae. Abdominal uncini without posterior elongation, markedly divergent among anterior and posterior setigers.

The species is named for R. Southern. Because of the poor state of the holotype, the diagnosis is based primarily on Southern's description of this specimen. The small paratype largely agrees.

Material studied: Type series.

Additions to the Description: These specimens have been well described by Southern (1914). McIntosh (1923) examined one of Southern's specimens and drew the hooks. His characterization of the species, however, combined Langerhans' description of *E. rosea* and Southern's text.

A palmate membrane unites the radioles for about half their length. A flange extends to the tips. The ends of the more proximal pinnules do not reach nearly as far as the more distal ones. The holotype has 12 abdominal setigers. The smaller paratype has 11, owing to one setiger missing in the anal depression. In the holotype (cf. Southern, 1914, fig. 33A), the anterior edge of the depression is the posterior end of the eighth abdominal setiger, followed by four more setigers (not three, as in the drawing; likewise, if fig. 33B was made from this specimen, one depression segment was omitted). The elevation of the ventral surface of the animal (cf. Southern, 1914, fig. 33B) anterior to the depression proper starts at the end of the seventh setiger so that the eighth one is a transitional segment. The diameter of polygonal eggs in the holotype is 80 μ to 90 μ.

After application of methyl green, practically only the ventral shields stain, which stand out anyway even in unstained material (cf. Southern, 1914, fig. 33A). A square area on segment one, the shields on setiger one, and the presetal shield on setiger two accept the dye most readily. Staining indicates one pair (rather than two) of rudimentary ventral shields in the eighth setiger. Some scattered stained cells occur around

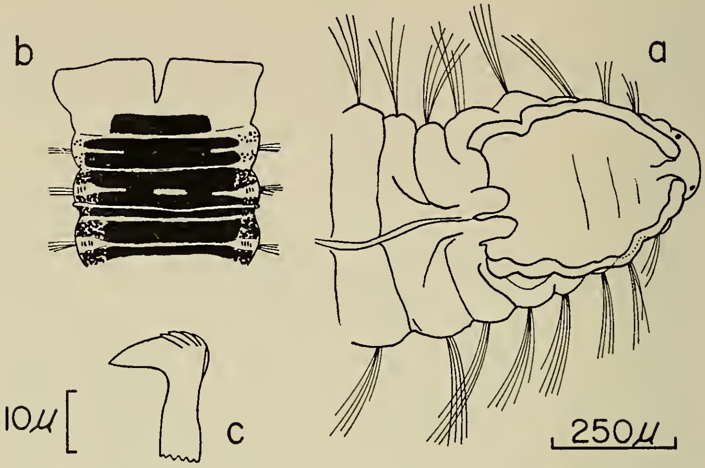

Fig. 5 *E. southerni incisa* new subspecies, from type series: a, posterior end in ventral view. The first segment shown is the sixth abdominal setiger; b, staining pattern of anterior end in ventral view; c, thoracic hook.

the parapodia, and in the holotype, transverse bands are present dorsally in the last anterior abdominal segments.

Euchone southerni incisa new subspecies

Fig. 5

Euchone rosea.—Kirkegaard, 1959, p. 101 *partim.*
Euchone rosea.—Day, 1967, p. 774 *partim.*

Types: Holotype: UCT, No. FAL 370K, from False Bay, 34°12′ S, 18°29.1′ E, 15 Nov. 1960, 40 m (collected by Ecological Survey, University of Cape Town). Fig. 37.6a in Day (1967) seems to be a drawing of this specimen.

Paratype from the same sample. UCT, No. FAL 370KK. (One specimen.)

Diagnosis: A subspecies of *Euchone southerni* with a marked ventral incision in the collar. Eight anterior abdominal setigers and five depression setigers. Abdominal uncini with posterior elongations.

Material studied: Type series.

Three specimens of the five from *Galathea* station 169, 3 January 1951, False Bay, Cape Province, 20 m (see Kirkegaard, 1959). ZMC (journal entry of 31 December 1952, as *E. rosea*).

Description: The types are complete and about 4.5 mm long, of which the branchial crown contributes 1.6 mm in both. The width is about 0.6 mm. The length of the largest specimen collected by the *Galathea* without a branchial crown is 4 mm, so that large specimens are at least 6 mm long.

The thorax has eight setigers, the abdomen 13, in all specimens except the paratype, which has 12 abdominal setigers. The anterior border of the anal depression is at the posterior margin of the eighth abdominal setiger in all specimens (Fig. 5a). Thus the depression comprises five setigers. However, the beginning of the depression is particularly difficult to locate in this species, and possibly its beginning is situated in the ninth abdominal setiger.

The radioles can be recognized only in the holotype; this specimen has two or three naked radioles and five pairs of radioles with a dozen (or slightly more) pairs of pinnules each. A conspicuous palmate membrane extends a little beyond half the length of the radioles and continues in a thick flange. The latter reaches beyond the origin of the distal pinnules and terminates in a very short filiform tip. The pinnules of the middle portions of the radioles terminate at about the same level as the distal pinnules.

The collar is of equal height dorsally and ventrally; in addition to the deep dorsal interruption, it has a distinct ventral incision (Fig. 5b; cf. fig. 37.6b of Day, 1967). The second thoracic setiger has the common postsetal girdle of glands. Ventral shields are distinct (see also below). Thoracic and abdominal setigers are two-ringed. A pair of eyes is found on the pygidium.

From the second setiger, thoracic notopodia each contain about a dozen setae in three series, limbate, subspatulate and short geniculate ones, the latter with a narrow wing. Neuropodial hooks have narrow heads (Fig. 5c). The abdominal limbate setae, about half a dozen per ramus in the anterior setigers, are conspicuous by being about half as long as the width of the abdomen. The notopodial uncini have small posterior elongations (cf. fig. 37.6f of Day, 1967).

After treatment with methyl green, the anterior ventral shields stain as shown in Fig. 5b; the following thoracic setigers are divided by an unstained ring in the plane of the parapodia. Each abdominal segment has two pairs of deeply stained shields, owing to the fecal groove. Each wing of the anal depression bears one area per segment of stained epidermal cells in the same position as the ventral shields of the anterior segments. Laterally and dorsally, a pair of rings of epidermal stained cells encircle the body except for the fecal groove in the thoracic and anterior abdominal segments; the rings, especially the presetal ring, are more conspicuous in the anterior abdominal segments. The depression segments have only one ring of stained cells per segment. Also the pygidium is stained.

Discussion: A subspecies (rather than a species) is erected because only two specimens have been found of the stem form and the variability of characters is unknown. Moreover, at the anterior end the pattern of staining upon treatment with methyl green can no longer be reliably studied in detail because of damage. Clear, nonmeristic differences between the stem form and the subspecies are the ventral incision of the collar and the form of the abdominal uncini. Possibily the form of the seventh, transitional abdominal setiger and the number of depression segments may be useful differential characters after more material has been studied. A mature specimen (holotype) of the stem species has clearly one abdominal segment fewer than the subspecies. The known geographic distribution of the subspecies suggests separation into species.

KEY

The key is arranged such that difficulties in deciding whether a segment is an anterior or transition segment should not lead to misidentification. The key does not distinguish between *E. rosea* and *E. olegi* because of insufficient knowledge of either species. It may also be noted that *E. rubrocincta* (Sars) from Ireland has only 12 anterior abdominal segments (rather than 13–15, as usual) and 10 setigers in the depression. However, it has somewhat more than 10 pairs of radioles with pinnules and is therefore not likely to be mistaken for *E. rosea* (with five to eight pairs) when the present key is used. After studying the type series of *E. eniwetokensis* Reish (13 to 14 abdominal setigers), I believe the species has to be included in *Chone*, and will report on it elsewhere.

1. 10 to 12 anterior abdominal setigers; 6 to 7 in the depression. Up to 8 pairs of radioles with pinnules .... *E. rosea*
– Fewer than 10 anterior abdominal setigers 2
2. 2 anterior abdominal setigers .... *E. trilobata*
– More than 2 anterior abdominal setigers 3
3. 5 or 6 anterior abdominal setigers; 3 setigers in the depression 4
– 6 to 9 anterior abdominal setigers; 4 or more setigers in the depression 5
4. A postsetal girdle of glands on the 1st abdominal setigers .... *E. hancocki*
– A presetal girdle of glands on the 3rd abdominal setiger .... *E. incolor*
5. 10 setigers in the depression, 8 anterior abdominal setigers .... *E. limynicola*
– 7 or fewer setigers in the depression; 6 to 9 anterior abdominal setigers 6
6. Two types of uncini within tori of anterior abdominal setigers (Fig. 3d, e) .... *E. arenae*
– One type of uncinus in anterior abdominal setigers; 8 anterior abdominal setigers 7
7. Ventral notch in collar (as in Fig. 3c). 4 setigers in the depression. Abdominal uncini without posterior elongation (as in Fig. 3d) .... *E. southerni southerni*

– Ventral incision in collar (Fig. 5b). 5 setigers in the depression. Abdominal uncini with posterior elongation (as in Fig. 1d) .... *E. southerni incisa*

GENERAL OBSERVATIONS

Of general interest to students of sabellid polychaetes, beyond the treatment of these species, is the observation that some small members of *Euchone* do not have the avicular uncini thought to be typical for *Chone* Kröyer, *Euchone* Malmgren, and also *Laonome* Malmgren (as in Fig. 3d) in the anterior abdominal segments, but have uncini that are pectinate in side view (as in Fig. 3e). Among the Sabellidae, pectinate uncini are found only in the genera of the *Oriopsis* group of the same subfamily, *Fabriciinae*, but they are common in related sedentary families. In *E. arenae*, pectinate uncini occur with the "typical" ones in the same parapods. Significantly, the former sit in the dorsalmost position of the tori, *i.e.*, they are the ontogenetically first-formed uncini. The experience that the ontogeny can recapitulate the phylogeny suggests that the pectinate uncini are, indeed, primitive features as is already apparent from their shape. Species of *Euchone* having such uncini are primitive at least in this respect.

Curiously, many of these primitive species are small, having short abdomina. They show many features observed also in *Oriopsis*, thought to be near the basis of the Sabellidae (cf. Banse, 1957). Species of this genus have a branchial crown without palmate membranes; radioles are bordered by a flange and have proximal and distal pinnules ending at the same level; ventral shields are poorly developed or absent; gonads can be found only in the thorax, and the thoracic segments can be lengthened so that they are as long, or longer than they are wide; finally, some species of *Oriopsis* have a third series of thin notosetae as have *Euchone* and *Chone*. Likewise in *E. hancocki*, eggs occur only in the thorax. A concomitant increase in length of posterior thorax segments is found in several species (cf. *E. incolor*, Hartman, 1965a, pl. 51, fig. a), making the segments longer than they are wide. Also this feature causes the habitus of some small *Euchone* species to be quite similar to that of species of *Oriopsis* or *Fabricia*.

Excepting the hooks, much of the similarity may be the consequence of small size, *i.e.*, may represent convergence. Since, however, the *Chone* group shows other features primitive among the Sabellidae (Johansson, 1927; see also Orrhage, 1962), it may be worth investigating whether evolution might have proceeded from *Oriopsis* through the *Chone* group toward the *Sabellinae*, or whether *Oriopsis* is on a side branch (starting from near *Chone—Euchone*) of the line leading to the *Sabellinae*. The male reproductive system may provide a clue for the onset of internal specialization leading to the derived forms such as *Fabricia*. If the unique spermaduct of *Fabricia* and *Manayunkia* Leidy (see Zenkevitch, 1925) is found in *Oriopsis*, this genus is on the side branch that has led to the two first-named genera and their relatives and thus cannot be the ancestor of *Chone—Euchone*. A clue for primitiveness may be provided by the number of ciliary rows on the pinnules of the radioles. As pointed out by Lewis (1968), *Fabricia* and *Manayunkia* have only three rows, two laterofrontal ones and a frontal one, as have the Serpulidae; large Sabellidae, however, have an additional abfrontal row (Nicol, cited by Lewis, 1968) as has *Euchone papillosa* (Sars) according to Evenkamp (1931). Three instead of four rows would make *Oriopsis* in one more very general character, more primitive than *Euchone*.

Because of its specialized anal depression, *Euchone* itself is not likely to be the basic genus of Sabellidae, but because of its closeness to *Chone*, many observations on the former may hold for the latter. Indeed, uncini intermediate between the pectinate and the "typical" *Chone* shape have been reported for *C. filicaudata* Southern (Southern 1914, pl. 15, fig. 32L; somewhat similar to Fig. 3e), so that at least this species may not be too far removed from the situation prevailing in some small species of *Euchone* that led to this discussion. It may be noted that several small species of *Chone* have ventral shields rather than a glandularized tissue that surrounds the entire thorax. Ventral shields should be present in reasonably basic Sabellidae.

SUMMARY

Of the previously known species of *Euchone* with 12 or fewer abdominal setigers preceding the anal depression, only *E. arenae*, *E. incolor*, *E. limnicola*, *E. rosea* (restricted) and possibly *E. olegi* are regarded as valid. *Euchone hancocki* and *E. southerni*, with a new subspecies *E. southerni incisa*, are newly described. *Euchone trilobata* is a new combination.

The occurrence of pectinate abdominal uncini in some of these species is regarded as a primitive character, further suggesting relationships of the *Chone—Euchone* group with *Oriopsis* of the same subfamily, *Fabriciinae*.

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